Appendix B:

Amended Record of Decision

July 15, 1998

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U.S. EPA SUPERFUND

RECORD OF DECISION AMENDMENT

WOODSTOCK MUNICIPAL LANDFILL SUPERFUND SITE

WOODSTOCK, MCHENRY COUNTY, ILLINOIS

JULY 1998

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DECLARATION

FOR THE

RECORD OF DECISION AMENDMENT

WOODSTOCK MUNICIPAL LANDFILL SUPERFUND SITE

WOODSTOCK, MCHENRY COUNTY, ILLINOIS

JULY 1998

RECORD OF DECISION AMENDMENT

SELECTED REMEDIAL ALTERNATIVE

DECLARATION

SITE NAME AND LOCATION

Woodstock Municipal Landfill Superfund Site (the Site); Woodstock, McHenry County, Illinois

STATEMENT OF BASIS AND PURPOSE

This decision document represents the United States Environmental Protection Agency's (U.S. EPA) selected final remedial action for the Site located in Woodstock, Illinois. This decision document was developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, with the National Oil and Hazardous Substances Contingency Plan (NCP). The decisions contained herein are based on information contained in the Administrative Record for this Site. The Illinois Environmental Protection Agency (IEPA) is expected to concur with the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from the site, if not addressed by implementing the response action selected in this Record of Decision (ROD) Amendment, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

The U.S. EPA, in consultation with the IEPA, is modifying the landfill cap profile, and the requirement to construct a groundwater pump-and-treat system to address residual vinyl chloride contamination in the upper water-bearing unit downgradient of the landfill. This remedy is intended to be the final action for the site, and addresses all contaminated media, including: contaminated soil, sediment, and groundwater, landfilled wastes, leachate generation and emission of landfill gases. The major components of the selected remedy include:

- Excavation and consolidation of contaminated sediments and sludges under the landfill cap;

- Installation and maintenance of a geosynthetic landfill cap in compliance with the specifications set forth in this ROD Amendment;

- o Installation and maintenance of a landfill gas venting system that is compatible with the type of cap specified in this ROD Amendment;

- o Installation and operation of a groundwater extraction, treatment, and discharge system as a contingent component of the remedy, required only if natural attenuation of the vinyl chloride plume does not occur at a rate and to the degree acceptable under state and federal law;

- o Development and implementation of a comprehensive monitoring program to ensure the effectiveness of the remedy;

- o Mitigation of wetland areas where contaminated sediment removal occurs;

- o Mitigation of wetland damage or loss during or after remedial activities are complete;

- o Development and implementation of a surface water and sedimentation control system;

- o Implementation of institutional controls to limit land and groundwater use.

The following remedial actions from the June 30, 1993, ROD remain in full force and effect: Fencing; Contaminated soil/sediment excavation and consolidation; Landfill gas collection system; Well monitoring and remedy monitoring programs; Institutional controls; Correction of work deficiencies; and Wetland mitigation.

STATUTORY DETERMINATIONS

The final selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable and satisfies the statutory preference for remedies which employ treatment that reduce toxicity, mobility, or volume as a principal element. Because this remedy may result in hazardous substances remaining on-site above health-based levels, a review will be conducted at least every five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

William E. Muno
Director, Superfund Division

7/15/98
Date

U.S. EPA SUPERFUND

RECORD OF DECISION AMENDMENT

WOODSTOCK MUNICIPAL LANDFILL SUPERFUND SITE

WOODSTOCK, MCHENRY COUNTY, ILLINOIS

JULY 1998

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION
WOODSTOCK MUNICIPAL LANDFILL
WOODSTOCK, ILLINOIS

I. SITE NAME, LOCATION AND DESCRIPTION

The Woodstock Municipal Landfill Superfund Site (the Site) is located on the south side of the city of Woodstock (the City), McHenry County, Illinois, a municipality with a population of approximately 16,179 residents. The Site is located south of Davis Road, southwest of the intersection of U.S. Route 14 and Illinois Route 47 and is shown on Figure 1. The coordinates for the Site are northeast quarter of Section 17, Township 44 North, Range 7 East (NE 1/4, Se 17, T44N, R7E).

The land surrounding the Site is a mixture of residential, agricultural, wetlands, commercial, and light industrial use. Land use immediately north of the Site is primarily residential and agricultural. Land use west of the Site is semi-agricultural with much of the land currently classified as a wetland. Wetlands are also located adjacent to the Site on the east. The Kishwaukee River runs along the southwestern perimeter of the Site. The City's wastewater treatment plant and additional wetlands are located south of the Site.

The Site geology consists of a complex sequence of unconsolidated glacial deposits which are approximately 200 feet thick. These deposits have been divided into four units; an upper sand and gravel aquifer, an intermediate clay till member, a lower clay till member, and a sand unit which overlies bedrock comprised of dolomite and shale.

It is important to note that the State of Illinois has designated the glacial and bedrock aquifers underlying the Site as Class I aquifers. A Class I designation signifies that the groundwater is either currently being used or has the potential to be used as a drinking water source, regardless of municipal land use or zoning restrictions.

Surface water runoff at the Site is generally to the west and south and is confined by drainage to the wetlands and subsequent infiltration or overland flow into the Kishwaukee River.

The nearest residents to the Site are located approximately 500 feet north of the Site. The principal threat at the Site is a plume of vinyl chloride contamination, which originates at the landfill and migrates to adjacent wetlands associated with the Kishwaukee River. The nearest existing residential well which may potentially be impacted by the contaminated groundwater if further migration occurs is located approximately 2500 feet southwest of the Site. Based on data collected during the remedial investigation (RI), the Predesign Investigation (PDI), and subsequent groundwater and surface water monitoring at the

Site, groundwater contamination has not migrated to the local residential wells used for drinking water. The majority of the residents in the City are provided water through a municipal drinking water supply system. This system is not considered to be threatened by the Site.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

The landfill had a number of different owners between 1935, when it was first used as a trash dump and open burning area, and when it was covered and classified as closed by the Illinois Environmental Protection Agency (IEPA) in October 1980. The current owner of the landfill property is the City.

Between approximately 1940 and 1958, William Gaulke operated the Site as a local trash dump and open burning area. Beginning in 1958, the Site was used by the City under a lease agreement with Mr. Gaulke as a household garbage and municipal landfill. The City purchased the property in 1968, and commenced using it for the disposal of household and municipal solid waste and various industrial solid wastes, including waste paint and coating materials, plating wastes, solvents, waste metals, inks and drummed material including polychlorinated biphenyls (PCBs). In addition, the City allowed Woodstock Die Casting Inc., an Allied Signal subsidiary, to dispose of approximately 7200 cubic yards of waste sludge at the landfill.

The IEPA filed a complaint against the City in 1972 regarding operation of the landfill. The Illinois Pollution Control Board (IPCB) issued an opinion finding that open dumping, liquid deposition without approval, failure to follow set guidelines, and operating without a permit. The City was ordered to cease and desist all violations, and to obtain the necessary permits. During this same time period, the IEPA requested the installation of a leachate collection system to address releases from the landfill. However, no system was installed and a waiver was granted by the IPCB based on the City's stated intent to close the landfill in the near future and because the leachate did not violate surface water standards at the time. The City discontinued disposal activities at the Site in 1975 and closed the landfill by covering it with fill material. Numerous inspections were conducted at the Site by the IEPA from 1975-1980. The IEPA continually notified the City during this time that, although the landfill was no longer accepting waste and was considered closed, the final cover was deficient. In 1980, the IEPA classified the Site as closed and covered. In 1983, the City was granted a permit from the IEPA to landfarm municipal sewage sludge at the Site. A second permit was issued by the IEPA in July 1988, but sludge application was discontinued prior to that date, so the later permit was not used.

During a July 1988 sampling investigation by the United States Environmental Protection Agency (U.S. EPA or Agency), residential wells located downgradient of the landfill were sampled and found to contain arsenic, selenium, and thallium in excess of the Safe Drinking Water Act maximum drinking water levels. A subsequent sampling investigation in December 1988 again detected these substances in the same wells, but the concentrations did not exceed the regulatory criteria.

National Priorities List

Based on the results of the U.S. EPA and the IEPA investigations and taking into account such factors as populations at risk, the potential of hazardous substances being present, the potential for contamination of drinking water supplies and the potential destruction of sensitive ecosystems, the Site was proposed to be placed on the National Priorities List (NPL) in June 1988. The Site was placed final on the NPL in October 1989.

June 30, 1993, Record of Decision

In 1989, the U.S. EPA identified several potentially responsible parties for the Site. In 1989, three of the potentially responsible parties agreed, pursuant to an Administrative Order on Consent (AOC), to investigate the nature and extent of contamination at the Site and to evaluate the most effective methods to clean up the Site. Two of the potentially responsible parties (hereinafter the PRP Group) actually performed the work required by the AOC. By June 1993, the PRP Group had completed the remedial investigation (RI) and feasibility study (FS). However, the U.S. EPA never approved the FS. On June 30, 1993, a Record of Decision (ROD) was signed for the Site that addressed all contaminated media, including contaminated soil, sediment, and groundwater; landfilled wastes; leachate generation; and emission of landfill gases. The two major components of the selected remedy required: (1) the installation and maintenance of a geosynthetic landfill cap in compliance with Title 35 *Illinois Administrative Code* (IAC), Subtitle G, Chapter 1, Subchapter I: Solid Waste and Special Waste Hauling, Part 811 14; and (2) installation and operation of a groundwater extraction, treatment, and discharge (pump-and-treat) system to remediate a groundwater contaminant plume containing vinyl chloride. Because negotiations for a Remedial Design/Remedial Action (RD/RA) Consent Decree were unsuccessful, the U.S. EPA issued a Unilateral Administrative Order (UAO) for RD/RA on September 2, 1994.

Institutional Controls

The UAO, Section VII, Paragraph 35 required land use restrictions to ensure that the physical and structural integrity of the cap and its components were not compromised. According to the

information submitted by the PRPs, the following actions have been taken:

- On September 17, 1991, the City passed Resolution No. 635 which prohibits location of wells of any kind, other than wells approved by the U.S. EPA and the IEPA as part of the site remediation and monitoring, and provides that no residential use or structure of any kind shall be located or built upon or constructed in or on the property which was formerly used as the City of Woodstock landfill. This restriction has been recorded in the Office of the Recorder of Deeds and is specified to be permanent.

- On January 7, 1997, the City passed Ordinance No. 2659 which reclassifies the property which was formerly used as the City of Woodstock landfill, from a R1S residential district to a M2 General Manufacturing District.

By letter dated April 27, 1997, the U.S. EPA queried whether Resolution No. 635 prohibited the construction of only residential structures or structures of any kind. This issue has not yet been fully resolved.

Predesign Investigation

Pursuant to the terms of the UAO, the PRP Group performed a PDI and Interim Monitoring Program (IMP). The report of the findings for the PDI, entitled *Predesign Investigation Report Woodstock Municipal Landfill Site, Woodstock, Illinois (August 1996)*, was approved by the U.S. EPA on August 1, 1996.

Additional tasks performed during the PDI to further characterize the Site included: performing a full topographic survey of the Site; advancing numerous soil borings to determine the extent and thickness of the waste deposits and cover soils; evaluation of landfill gas; and further hydrogeologic characterization which included installation of additional monitoring wells, piezometers and an extraction well, performance of an aquifer pumping test and collection of additional rounds of groundwater, surface water and sediment samples at the Site. Collectively, these post-ROD studies resulted in the PRP Group, the U.S. EPA and the IEPA obtaining a significantly more thorough understanding of site-specific conditions.

One of the more important findings of the PDI is that the landfill's impact on groundwater appears to be less than the RI/FS data would have indicated. RI sampling results established that contamination in the landfill had no significant impact on the deeper aquifer zones at the Site. Groundwater in the upper unit, however, was found to contain contamination. The

contaminant of concern in the upper water-bearing unit downgradient of the landfill is vinyl chloride. Receptors of groundwater discharge from the upper water-bearing unit include the Kishwaukee River and the wetlands areas present immediately west and south of the landfill.

The PDI demonstrated that the vinyl chloride contamination in groundwater is restricted to a limited area, smaller than the area estimated during the RI. In addition, groundwater monitoring activities performed since the RI have suggested that the concentrations of vinyl chloride appear to be declining, and that the vinyl chloride plume appears to be stagnant (not moving). It is important to note, however, that although the concentrations of vinyl chloride present at the Site are lower than those detected during the RI, the levels of vinyl chloride present at the Site still remain above the federal maximum contaminant level (MCL). Moreover, it has not yet been demonstrated to the satisfaction of the U.S. EPA, that the trend in vinyl chloride concentrations will continue to decrease over time in a predictable manner.

Petition for an ESD and ROD Amendment

In October 1996, the PRP Group petitioned the U.S. EPA for an Explanation of Significant Differences (ESD) to delay the design and implementation of the groundwater pump-and-treat system based on data obtained during the PDI and the quarterly monitoring events. However, the U.S. EPA could not grant the ESD for the delay of the groundwater pump-and-treat system, without an adequate landfill cap in place.

In addition to reducing the potential risk posed by exposure to landfill contaminants, capping the landfill would reduce precipitation infiltration through the landfill, thereby reducing leachate generation. Ground water contaminant loading, leachate generation, and seepage into the wetlands would then be reduced or eliminated. The U.S. EPA also had determined that construction of a drainage layer above the barrier layer was necessary to ensure long-term protection of human health and the environment. An efficient drainage layer with a hydraulic conductivity greater than 1×10^{-1} cm/sec, would virtually eliminate standing water in the protective layer, thus eliminating infiltration through the barrier layer. Also, the Agency felt that a gas venting system would reduce potential risks due to the landfill gases. For all of the above reasons, the U.S. EPA denied the ESD Petition unless and until it appeared likely that the PRP Group would comply with the landfill cap construction requirements of the UAO.

In a document dated August 1, 1997, the PRP Group petitioned the U.S. EPA Region 5 for a ROD Amendment seeking the following modifications to the original ROD for the Site: (1) the

identification of 35 IAC 807 as the *applicable or relevant and appropriate requirement* (ARAR) for the landfill cap; and (2) deletion of the requirement for an active pump-and-treat groundwater collection and treatment system. In other words, the PRP Group renewed its efforts to have the pump-and-treat system deleted as a requirement of the selected remedy for the Site, and further sought to construct a landfill cap that complied with the landfill cap standard in effect at the time the landfill was closed, rather than the standard in effect at the time of signature of the original ROD.

The U.S. EPA, in consultation with the IEPA, began to evaluate whether, in light of the PDI data, the landfill cap component of the originally-selected remedy could be modified in a way that resulted in significant cost savings for the PRP Group, but remained protective of human health and the environment. The U.S. EPA and the IEPA technical and legal representatives met on several occasions to discuss potential new parameters for a modified landfill cap.

III. REASON FOR ROD AMENDMENT

The June 30, 1993, ROD remedy included the following elements: A) Fencing; B) Contaminated soil/sediment excavation and consolidation; C) Capping; D) Groundwater remediation and treatment system; E) Landfill gas collection system; F) Well monitoring and remedy monitoring programs; G) Institutional controls; H) Predesign, additional and supplemental investigations and studies; I) Correction of work deficiencies; and J) Wetland mitigation. The two most significant components of the original remedy required the construction of a cap that met or exceeded the requirements of Title 35 of the IAC Section 811.314 and the construction of a groundwater pump-and-treat system.

Based upon the results of the PDI, it appears that the landfill's impact on groundwater is less than the RI/FS data would have indicated. The PDI demonstrated that the vinyl chloride contamination in groundwater is restricted to a limited area, smaller than the area estimated during the RI. In addition, groundwater monitoring activities performed since the RI have suggested that the concentrations of vinyl chloride appear to be declining, and that the vinyl chloride plume appears to be stagnant (not moving). It is important to note, however, that although the concentrations of vinyl chloride present at the Site are lower than those detected during the RI, the levels of vinyl chloride present at the Site still remain above the federal maximum contaminant level (MCL). Moreover, it has not yet been demonstrated to the satisfaction of the U.S. EPA, that the trend

in vinyl chloride concentrations will continue to decrease over time in a predictable manner.

As a result of the PDI, comments received from interested persons, and the U.S. EPA's growing expertise with regard to landfills and contaminated groundwater, the Agency decided to amend the original ROD. The U.S. EPA issued a Proposed Plan for an Amendment to the 1993 ROD, which identified the U.S. EPA's proposed revisions to the original ROD and described the proposed new cleanup remedy for remediating the Site. The Proposed Plan was available for public review and comment from February 23, 1998, through April 8, 1998. The Proposed Plan was required by Section 117 (a) of the Comprehensive Environmental Response, Compensation and Liability Act(CERCLA or Superfund), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986. The U.S. EPA held a public meeting on March 4, 1998, to accept comments from residents and other individuals interested in the Site.

Previous investigations and design reports, as well as any other pertinent documents in the Administrative Record and Information Repositories, should be consulted for in-depth details on the U.S. EPA's development and evaluation of the proposed revisions to the cleanup remedy.

IV. HIGHLIGHTS OF COMMUNITY PARTICIPATION

Compliance with the public participation requirements of Section 113 (k)(2)(B)(I-v) of the CERCLA, as amended by SARA, have been achieved for the Site by:

- A Site information repository was established at the Woodstock Public Library to allow local access to Site-related documents;
- The Site Administrative Record has been updated to include the Proposed Plan for a ROD Amendment and other documents relied upon for this ROD Amendment, and has been placed in the Site information repository;
- A formal advertisement announcing the commencement of the public comment period, the availability of the proposed plan, and the time and place of the public meeting was placed in the Northwest Herald and the Woodstock Independent on February 25, 1998, local papers of general circulation;
- The Proposed Plan for a ROD Amendment was released for public comment and placed into the Administrative Record on February 23, 1998;

- A thirty (30) day comment period was established and scheduled to end on March 24, 1998;

- A public meeting was held on March 4, 1998, at the Woodstock Public Library at which the U.S. EPA presented the Proposed Plan to the community and received verbal comments. A transcript was kept of the public meeting and was made available to the public and placed in the Administrative Record and Site repositories;

- The U.S. EPA granted a fifteen (15) day extension of the public comment period on March 4, 1998, extending the closing date to April 8, 1998;

- An advertisement was placed in the Northwest Herald on March 20, 1998, and in the Woodstock Independent on March 25, 1998, announcing the extension of the public comment period to April 8, 1998;

- The U.S. EPA has received oral and written comments regarding the Proposed Plan for a ROD Amendment. Comments have been addressed in the attached Responsiveness Summary (Appendix A).

This ROD Amendment will become part of the Administrative Record pursuant to the *National Oil and Hazardous Substances Contingency Plan* (NCP), Section 300.825(a)(2). The Administrative Record can be found at the Site repositories located at:

1) Woodstock Public Library
414 West Judd Street
Woodstock, Illinois 60098

2) U.S. EPA Region 5 Records Center
Ralph H. Metcalfe Building, 7th Floor
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

V. SCOPE AND ROLE OF THE SELECTED REMEDY

This ROD Amendment modifies only two components of the original ROD: the landfill cap and pump-and-treat requirements. A landfill cap still must be constructed at the Site, but the components of that cap have been revised in a way that results in significant costs savings. It is possible that the pump-and-treat system required by the original ROD may still need to be constructed in order to remediate the contaminated groundwater at the Site, but this ROD Amendment makes this component of the original remedy contingent on future data results.

The U.S. EPA estimates the cost of a landfill cap constructed in accordance with this ROD Amendment to be approximately $4.5-million, a significant savings over the estimated cost of the landfill cap required by the original ROD (~$6.2-million, adjusted for 1998 costs and dollars). If groundwater data to be collected at the Site during the next several years establishes that no pump-and-treat system is necessary, additional cost savings of approximately $800,000 will be realized. The U.S. EPA's decision regarding the necessity for a pump-and-treat system will depend on whether the groundwater plume is naturally attenuating at a rate and to the degree acceptable under state and federal law.

The following remedial actions from the June 30, 1993, ROD remain part of the final remedy for the Site: (A) fencing; (B) contaminated soil/sediment excavation and consolidation; (E) landfill gas collection system; (F) well monitoring and remedy monitoring programs; (G) institutional controls; (I) correction of work deficiencies; and (J) wetland mitigation.

VI. SUMMARY OF SITE CHARACTERISTICS

The RI was conducted by the PRP's contractor, Warzyn, and was initiated in July 1990. The investigation was completed in June 1992, when the Final RI Report was issued. The RI identified the types of contaminants that are migrating from the landfill, and assessed the potential impact of contaminant migration on human health and the environment. The key conclusions which may be surmised from this data are as follows:

- Groundwater contamination was detected in the upper aquifer immediately southwest and downgradient of the landfill. The contaminant of concern, vinyl chloride, was detected at concentrations that exceed the MCL of 2 ppb for this compound.

- Contamination was detected in leachate gas samples and in leachate groundwater samples collected from wells on the landfill. The contaminants included volatile organics such as benzene, ethylbenzene, toluene and xylene. In addition, inorganic contaminants such as arsenic, barium, chromium, lead and mercury were also detected in excess of regulatory criteria. The leachate was also identified as the source of contamination that is adversely affecting the groundwater, surface water and sediments at the Site.

- Contamination was detected in surface soils, surface water, and sediments at the Site. These three media were contaminated with a wide range of volatile organic compounds

(VOCs), semi-volatile organic compounds (SVOCs), and inorganic compounds.

- Leachate generation, if not controlled, will continue to cause further releases to the impacted media and surrounding wetlands and result in further adverse environmental impacts. While the wetlands are currently limiting the full impact of the landfill releases to the environment through attenuation, the capacity and capability of the wetlands to function in such a manner is limited.

As noted above, following the ROD, the PRPs performed an extensive PDI and IMP under the UAO. Consequently, a more extensive database was developed to supplement the existing RI data. The PDI and IMP data suggests that the vinyl chloride contamination in groundwater is restricted to a limited area and that concentration levels may be declining. However, concentration levels of vinyl chloride still exceed federal and state cleanup levels. Moreover, it has not yet been demonstrated to the satisfaction of the U.S. EPA, that the trend in vinyl chloride concentrations will continue to decrease over time in a predictable manner.

During the RI, sampling results indicated no impact to the deeper groundwater zones at the Site. Groundwater in the upper unit was the only groundwater found to contain contamination. Further groundwater sampling performed during the PDI indicated the following with respect to groundwater quality in the upper water-bearing unit:

- Benzene and vinyl chloride were the only VOCs to exceed the primary MCLs or the Illinois Class I Standard. Benzene exceeded the MCL sporadically at only one monitoring well location. Only vinyl chloride was found to consistently exceed the applicable MCL or Class I Standards. Vinyl chloride exceedences occurred at two monitoring wells located downgradient of the Site. The vinyl chloride concentrations downgradiert of the landfill appear to have decreased by approximately one-third since the RI.

- SVOCs, pesticides and PCBs were not contaminants of concern in groundwater.

- Six target analyte list (TAL) metals were found to exceed applicable groundwater quality criteria. Five of the six exceedences were found to occur rarely and were not indicative of landfill-related impacts to groundwater. Only one of these six TAL metals, namely iron, was found to regularly exceed applicable groundwater quality criteria.

However, iron is not considered a health risk and since these exceedences occurred at both upgradient and downgradient locations, it may be attributable, at least in part, to natural groundwater chemistry.

- As a result, vinyl chloride appears to be the only contaminant of concern in the upper water-bearing unit downgradient of the landfill. The Kishwaukee River and associated wetlands, located immediately west and south of the landfill, are ecological receptors of groundwater discharged from the upper water-bearing unit.

Summary of Existing Hydrogeologic Data

During the RI, groundwater under the Site was observed within an upper water table aquifer and within sand seams in the lower till units. Groundwater flow in the upper water-bearing zone was generally observed to be towards the south/southwest and calculated hydraulic gradients in the upper water-bearing zone ranged from 0.0034 to 0.0167 feet per foot across the Site. Receptors for groundwater discharge from the upper water bearing unit include the Kishwaukee River and the wetlands areas present to the west and south of the Site. Downgradient of the landfill, the upper water-bearing zone is overlain by peat deposited in the wetland area. These groundwater flow patterns were confirmed and refined during the PDI.

Groundwater Flux and Surface Water Infiltration

During the RI, the water balance for the landfill was evaluated to derive an estimate of groundwater contribution to surface water discharge of the Kishwaukee River and surrounding wetlands. The results of this evaluation indicated that total groundwater discharge to surface water downgradient of the Site was approximately 30,000 gallons per day.

The HELP Model simulation was used during the RI to obtain an estimate of surface water infiltration through the existing landfill cover. The HELP model predicted that surface water in ..tration over the landfill amounts to approx: ..ately seven inches per year. During the PDI, detailed field studies more accurately defined the thickness and areal extent of the upper water-bearing unit and hydrogeologic parameters such as hydraulic conductivity. The groundwater mass flux along the downgradient portion (western and southwestern boundaries) of the landfill was calculated using borehole and hydrogeologic data developed during the PDI. The cross-sectional area of the upper aquifer was determined through borehole logs, and hydrogeological parameters such as hydraulic conductivity were obtained from pumping test data developed during the PDI. Based upon the data developed during the PDI and IMP, the U.S. EPA has concluded that the total groundwater flux appears to be less than was calculated during

the RI. The groundwater pumping test conducted during the PDI also confirmed that the groundwater flux to the wetlands south and west of the Site is considerably less than projected during the RI. It was determined that the maximum sustainable pumping rate was approximately five gallons per minute. This pumping rate is one-tenth the rate projected during the RI/FS when the groundwater pump-and-treat remedy was evaluated. During the 72-hour pump test conducted during the PDI, groundwater was extracted from the upper water-bearing unit at an average rate of 5 gallons per minute (approximately 7,200 gallons per day). Pumping the upper water-bearing unit at this rate over a 72-hour period resulted in drawdown along the entire southern and southwestern boundary of the landfill, confirming that the groundwater flux of the vinyl chloride plume was much less than the average pumping rate.

In summary, based upon the data developed during the PDI and IMP, the post-ROD data demonstrates that the groundwater flux in the shallow aquifer beneath the Site to the Kishwaukee River, and associated wetlands to the south and west, is less than the volume projected during the RI. The rate of surface water infiltration also appears to be less than determined during the RI. This finding is important because infiltration is directly related to leachate generation. The leachate generation rate of the landfill, based upon the PDI and the revised HELP model runs, may be much lower than originally believed. Since contaminants may be transported from the landfill through the migration of leachate, the amount of contamination potentially flushed from the landfill also may be less than originally believed. Given the revised leachate generation rates and the concomitant reduction in the potential for contaminant mobilization, an active groundwater pump-and-treat system may no longer be warranted, and a natural attenuation remedy may be more appropriate.

Existing Landfill Cover

During the PDI, 64 soil borings were advanced on the landfill to determine the thickness of the cover. Boring logs compiled from this much more plentiful database indicates that the cover material consists primarily of silty clay. The average cover thickness encountered during the PDI was 2.7 feet, but ranged from 0.4 feet to 6.0 feet.

HELP Model Estimates of Surface Water Infiltration

The surface water infiltration estimate produced during the RI (7 inches per year) was obtained using a hydraulic conductivity (k) value of 1.5×10^{-3} centimeter per second (cm/s) for the cover soil, a value more than four orders of magnitude higher than the laboratory-determined k values of two cover soil samples, and (2)

an average annual precipitation of 36 inches instead of the 32 inches reported in a soil survey report for McHenry County published in 1965. Use of the greater *k* value and average annual precipitation rate values probably inflated the surface water infiltration estimates produced by the HELP model during the RI.

Although the HELP model estimate obtained during the RI can be challenged because the rationale for using a *k* value of 1.5×10^{-3} cm/s is not clear, the HELP model estimate obtained by the PRP Group using the laboratory-determined *k* values is questionable for two reasons. First, a *k* value obtained from two soil samples cannot be considered representative of the *k* value of the soil cover spanning an area of over 43 acres. Second, a laboratory-determined *k* value can represent the *k* value of small soil samples tested in the laboratory, but it cannot represent the *k* value of the landfill cover as a whole.

Moreover, it must be noted that the existing cover contains numerous macropores such as shrinkage and freeze-thaw cracks, root holes, and worm holes that can significantly increase infiltration through the cover but that are not represented in small soil samples collected for laboratory testing. As revealed by a preliminary investigation of macropores visible on the surface of the existing cover at the Site conducted by the U.S. EPA on April 23, 1997, various types of macropores exist in the cover soil, but their impact on surface water infiltration through the existing cover cannot be estimated using the HELP model or any other existing model. The U.S. EPA's observations, however, led the Agency to conclude that the current cap has deteriorated so significantly that it is ineffective in preventing infiltration,

Considering (1) the lack of information regarding the degree of compaction of existing cover soils; (2) the absence of specifications regarding compaction of cover soils in 35 IAC 807, the standard under which the existing cap was constructed; and (3) that the existing landfill cap has been subject to repeated wet/dry and freeze/thaw cycles since its initial installation in 1980, it is reasonable to assume that the existing cover consists of relatively uncompacted soils.

In the HELP model, the default *k* value for uncompacted silty clay is 4.2×10^{-5} cm/s, use of which produces a surface water infiltration estimate of 4.46 inches per year. This infiltration estimate is based on the HELP model's assumption that leakage through cover soil occurs because of leakage through soil micropores only. However, this assumption is probably not valid because surface-connected macropores are known to conduct large quantities of water through soil. Considering the HELP model

infiltration estimate of 4.46 inches per year. In light of the potential impact of the macropores existing in the 2.7-foot-thick soil cover at the Site, the actual infiltration through the existing cover, although impossible to estimate accurately using any existing model, is likely to be closer to the RI estimate of 7 inches per year than the 1.9 inches.

Extent of Vinyl Chloride Contamination

During the RI, vinyl chloride was detected at concentrations exceeding the primary MCLs in groundwater samples collected from two monitoring wells (MW-4d and MW-8) located downgradient of the landfill. The concentration of vinyl chloride in samples collected from these monitoring wells ranged from 16 to 21 micrograms per Liter (μg/L). An elliptically shaped vinyl chloride plume of approximately 1,000 feet in length and 400 feet in width along the southern and southwestern (downgradient) landfill boundary was identified during the RI. The vinyl chloride plume presented in the RI was defined on the basis of vinyl chloride data from monitoring wells MW-3s, MW-4d, MW-5s, MW-8, MW-9 and MW-10. Monitoring wells MW-3s and MW-5s were located a considerable distance from the two monitoring wells where vinyl chloride was actually detected. For example, MW-3s and MW-5s are located approximately 700 feet from the nearest monitoring well where vinyl chloride was detected. The total volume of water within this plume was calculated to be approximately 6.6 million gallons.

Three additional monitoring wells (MW-12, MW-13, and MW-14) were installed in the vicinity of the vinyl chloride plume during the PDI to further delineate its limits. Two of these monitoring wells (MW-12 and MW-13) were located closer to the two RI monitoring wells where vinyl chloride was detected. The remaining well, MW-14, was also located in closer proximity to MW-4d and MW-8 but was also placed between MW-9 and MW-10 to determine whether the vinyl chloride plume extended further towards the southwest. The data developed during and since the PDI demonstrate that vinyl chloride was not detected at concentrations exceeding the MCL at any of the new monitoring wells installed during the PDI. On the basis of the new monitoring wells installed in closer proximity to the center of the plume, the vinyl chloride plume is approximately one-third smaller than the plume defined during the RI. The groundwater sampling conducted during and since the RI show that the vinyl chloride plume is limited to the landfill wetland area to the south of the landfill. Additionally, the vinyl chloride concentrations at MW-4d and MW-8, in the center of the plume, have decreased over time. Using the post-ROD data, the volume of impacted groundwater within the plume is now estimated at 4.4 million gallons.

The post-ROD studies indicate that the areal extent of the vinyl chloride plume is limited and the plume is not expanding. Additionally, the post-ROD studies have shown that the upper water-bearing unit pinches out downgradient of the landfill, thus, inhibiting the downgradient migration of vinyl chloride. Groundwater in the upper aquifer slowly migrates through the overlying clay and peat as it discharges to the wetlands and the Kishwaukee River. In addition, vinyl chloride has not been detected in surface water samples collected from the Kishwaukee River or surrounding wetlands. This data suggests that natural attenuation may be effectively removing vinyl chloride as the groundwater migrates through the overlying clay and peat deposits, as described below.

VII. EFFECT OF PDI DATA ON REMEDY SELECTION

At the request of the PRP Group, the U.S. EPA, in consultation with the IEPA, evaluated whether, in light of the PDI data, the pump-and-treat component of the remedy was necessary. The PRP Group also requested that the U.S. EPA evaluate whether, given the PDI data, a less costly landfill cap could be constructed. Accordingly, the U.S. EPA compared what had been required in the original ROD with potential alternative remedial actions.

A. Pump-and-Treat vs Natural Attenuation

Post-ROD Data

The post-ROD database shows the concentrations of vinyl chloride at monitoring well MW-4d range from 9 to 14 μg/L and at monitoring well MW-8 have ranged from 7 to 12 μg/L. These vinyl chloride concentrations are approximately one-third lower than the concentrations observed during the RI (16 to 21 μg/L at MW-4d and from 20 to 21 μg/L at MW-8). This trend of decreasing vinyl chloride concentrations is significant since it demonstrates that there appears to no longer be a significant influx of vinyl chloride from the landfill and that natural attenuation of vinyl chloride may have occurred even during the relatively short monitoring period since the completion of the RI.

Using the analytical data developed during the RI and the PDI, and the first order decay formula, the length of time required for the vinyl chloride concentrations to reach the MCL was calculated. Assuming that the vinyl chloride concentrations will continue to decline at this rate, vinyl chloride concentrations in the center of the plume will reach the MCL of 2 μg/L in approximately 20 to 25 years. Therefore, natural attenuation may lower the vinyl chloride concentrations in groundwater to the MCL in about 25 years. This 25-year estimate assumes that (1) the coefficient of first-order decay of vinyl chloride concentrations

will remain constant throughout the duration of the groundwater remediation, and (2) the source of vinyl chloride in the landfill has been removed.

Natural Attenuation Remedy

The natural attenuation remedy is described in the Preamble to the NCP as a process that will effectively reduce contaminants in groundwater to concentrations which are protective of human health and sensitive ecological environments in a reasonable timeframe. The natural attenuation remedy is not a no-action alternative. Rather, contaminant reduction is accomplished by any or all of the following mechanisms; dilution, adsorption, dispersion, and biodegradation. The circumstances under which the natural attenuation remedy should be considered include those situations where active restoration is not practicable, cost-effective, or warranted because of site-specific conditions and those situations where physical and chemical attenuation mechanisms will effectively reduce contaminants in groundwater to concentrations protective of human health in a timeframe that is comparable to that which could be achieved through active restoration.

Recent guidance disseminated by the U.S. EPA has clarified the circumstances under which a natural attenuation remedy should be used. These circumstances include the following:

- there is no demand for the resource while the natural attenuation remedy is in progress;
- long-term exposure controls are in effect to prevent exposure to contaminated groundwater and ensure protectiveness;
- the potential for further contaminant migration is low; and
- the natural attenuation remedy is employed in combination with other remedial measures.

The Site meets each of the criteria stated above. Vinyl chloride degradation behavior and the degradation rate is dependent upon a number of environmental factors including the availability of electron donors (such as natural or anthropogenic organic carbon) and the concentration of acceptors (such as dissolved oxygen, nitrate, iron(III) and sulfate) in groundwater. Natural carbon can be expected to be plentiful in the wetland areas where the presence of peat is well documented. Vinyl chloride degrades in a reducing environment, which should be present in a wetland. The most recent data developed for the Site appears to indicate that the natural attenuation process has been reducing the

concentrations of contaminants downgradient of the landfill. In addition, the time-frames for implementation of the active pump-and-treat and the natural attenuation remedies appear to be similar. Currently, there is no demand for the groundwater either on-site, or off-site in the vicinity of the vinyl chloride plume. Furthermore, institutional controls, current regulations, and practical land-use considerations will effectively prevent exposure to groundwater. The hydrogeological and contaminant distribution data developed demonstrate that the vinyl chloride plume is stagnant and the maximum concentrations within this plume appear to be decreasing. Also, the footprint of the vinyl chloride plume determined during the PDI is smaller than that reported during the RI, and the upper water-bearing unit pinches out downgradient of the landfill. In addition, this ROD Amendment requires that other remedial measures be employed at the Site, most significantly, capping of the landfill. Finally, the natural attenuation remedy does not carry the potential for deleterious effects to the wetlands that are present with the active pump-and-treat remedy. Damage to the wetlands under a groundwater pump-and-treat scenario include physical damage resulting from system construction and the potential dewatering of wetland areas during long-term system operation.

On the basis of the above evaluation, it is clear that this Site meets each of the U.S. EPA's criteria for implementation of a natural attenuation remedy.

Pump-and-Treat System

The active groundwater pump-and-treat system required by the original ROD would have reduced the vinyl chloride concentrations in the plume to the MCL within approximately 16 to 22 years. This estimate is based upon the following assumptions:

- there is approximately 4.4 million gallons of contaminated groundwater present in the vinyl chloride plume;
- a sustained pumping rate of between 4 and 5 gallons per minute will be achieved during the remediation; and
- ten aquifer pore volumes will need to be flushed from the plume area to achieve the MCL for vinyl chloride.

Summary

Evaluation of the above information demonstrates that there does not appear to be a significant difference in the length of time required to effect cleanup between the active pump-and-treat remedy and the natural attenuation remedy. The vinyl chloride plume is located entirely within the wetland area downgradient of the Site. The vinyl chloride present within this plume appears

to be undergoing natural attenuation. Given the additional concerns regarding the potential deleterious effects to the wetlands which may result during implementation of the pump-and-treat remedy (which were mentioned in the original ROD), this remedial technology may not be warranted and a natural attenuation remedy may be more environmentally appropriate.

Post-ROD Amendment Sampling Program

The U.S. EPA is not yet prepared, however, to eliminate the pump-and-treat component of the original remedy entirely. Although the post-ROD vinyl chloride concentrations in MW-4d and MW-8 are lower than those observed during the RI, the post-ROD data may also show a trend of increasing vinyl chloride concentrations in both wells. The vinyl chloride concentration in MW-4d rose from 9 micrograms per liter (ug/L) in October 1995 and March 1996, to 14 ug/L in April 1997. Similarly, the concentration in MW-8 increased from 7 ug/L in June 1996, to 12 ug/L in September 1996 and April 1997. In light of the reduction in vinyl chloride concentrations between the RI and the post-ROD period, the recent trend of increasing vinyl chloride concentrations may indicate the presence of a source of vinyl chloride whose strength varies over time. The decrease in vinyl chloride concentrations between the RI and the post-ROD period may be the result of the varying strength of the vinyl chloride source rather than natural attenuation, or changes in water chemistry that interrupted the natural attenuation process. Therefore, the actual timeframe for remediation of the vinyl chloride plume via natural attenuation cannot be estimated with reasonable accuracy until additional information is developed from a post-ROD Amendment sampling program.

B. Landfill Cap Modifications

The original ROD for the Site required construction of a landfill cap that included the following parameters:

- placement of a geosynthetic liner with a bentonite clay layer, with a 1 x 10-7 cm/s permeabili[illegible],
- three feet of final cover layer;
- placement of a drainage layer, rooting zone layer and topsoil;
- installation of a surface water control system.

As noted above, the PDI data indicated that the rate of surface water infiltration appears to be less than the rate determined during the RI. As a result, the landfill may be generating less

leachate than the U.S. EPA believed at the time of the original ROD.

The U.S. EPA also evaluated the PDI data in light of recent guidance generated by Region 5's Working Group Reviewing Landfill Cover Requirements. (See April 14, 1998, Region 5 Guidance, contained in the Administrative Record for the Site.) The Region 5 Workgroup concluded, among other things, that frost protection and drainage layers were two critical landfill cap components, and that often these components can make for a more effective remedy at a competitive cost. The Workgroup concluded that drainage layers are particularly important at Sites where a leachate collection or a groundwater containment system has not been required.

In light of the new data and increased technical expertise on landfill cap designs, the U.S. EPA, in consultation with the IEPA, reviewed the landfill cap components of the original ROD. The U.S. EPA sought to determine whether an alternative landfill cap could be constructed that remained compliant with 35 IAC 811, the ARAR for the landfill cap, did not need to include a frost-protective layer, but did include a drainage layer as a consideration in lieu of not having a leachate collection system. The U.S. EPA, in consultation with the IEPA, concluded that 35 IAC 811 would be satisfied, and frost protection of the low permeability layer would not be necessary, if a geomembrane was used and the landfill cap included the following components:

- recompacting the top 12 inches of the existing cover to achieve a 95 percent compaction by Standard Proctor Density (SPD) tests, in order to provide a firm soil foundation suitable for installing the landfill cover (if 95 percent compaction is not achievable, compaction will be to the highest achievable percentage, but not less than the compaction achievable by a minimum of three (3) passes over the regraded area with a vibratory compactor of at least 10-tons total weight);

- installation of a 40-mil linear low density polyethylene liner;

- installation of a drainage layer;

- installation of a geofabric to protect the integrity of the drainage layer;

- Installation of 24 inches of soil cover above the drainage layer, 6 inches of which must be topsoil;

- final grading of the total cover to no less than 2.0% slope.

Summary

The June 30, 1993, ROD required the design and implementation of a groundwater pump-and-treat system to remediate the vinyl chloride plume. It appears from the PDI and IMP that this remedial component may not be needed, since groundwater remediation may be effectively accomplished through natural attenuation. Groundwater migration through natural clays and organic peat material appears to be providing natural attenuation of residual contamination prior to discharge to the Kishwaukee River.

Therefore, through this ROD Amendment, the U.S. EPA (in consultation with the IEPA) is making the implementation of a groundwater pump-and-treat remedy a contingent part of the final remedial action for the Site. After installation of the landfill cap, ground water and surface water quality will be evaluated through the performance of regular monitoring events, which will be detailed in the final RD/RA Work Plan. If the data from the monitoring program demonstrates that natural attenuation is remediating the vinyl chloride in the groundwater plume to a degree and at a rate acceptable to the U.S. EPA (in consultation with the IEPA), then the design, construction, and implementation of the groundwater pump-and-treat will not be required as part of the Site's final remedy. If, however, the U.S. EPA, in consultation with the IEPA, determines that the monitoring data indicates that natural attenuation is not occurring to an acceptable degree or at an acceptable rate, then the pump-and-treat system required in the original ROD will remain a part of the final remedial action for the Site.

The U.S. EPA will evaluate the effectiveness of natural attenuation as part of the 5-year review process required for sites where wastes are left on site. If the data available at the first such review is insufficient for a reliable trend analysis, evaluation of remedy performance will be completed in the subsequent review or at some earlier time to be established during the initial 5-year review.

Finally, the landfill cap specified in this ROD Amendment will significantly reduce leachate generation, which should further improve the groundwater quality. Furthermore, the cap will comply with the landfill cap ARAR, and will generally not be subject to damage from freeze/thaw or wet/dry cycles. The landfill cap specified in this ROD Amendment also requires an efficient drainage layer that will virtually eliminate standing water from the protective layer, thus eliminating infiltration through the barrier layer, thereby increasing the operational

effectiveness of the landfill cap in limiting surface water infiltration.

These modifications to the original ROD, based primarily upon the PDI data and increased technical expertise with landfills, will result in a reduction in the cost of the remedy of approximately $2.5 million.

VIII. SUMMARY OF SITE RISKS

Risks to Human Health

The assessment of impacts to human health is called the Baseline Risk Assessment (BLRA). Using information about what contaminants are present at the Site, as well as the concentrations, quantities, locations and ability of the contaminants to migrate, a BLRA was developed to determine what, if any, human health risks are posed by the Site.

Separate calculations were made for those compounds that can cause cancer and for those that can have other health effects. For the compounds that can cause cancer (carcinogens), risks were estimated as the additional possibility of developing cancer due to exposure to the compounds. For the non-cancer causing compounds (noncarcinogens), a risk number called the hazard index (HI) was calculated so that, if the risk is less than or equal to 1, no adverse health effects would be expected. If the risk is greater than 1, adverse health effects are possible.

The BLRA indicated that the Site, as it now exists, may pose an unacceptable cancer risk (CR) of 5×10^{-5} or CR = 5×10^{-5}) to trespassers (children/adolescents playing on-Site) through exposure to surface soils. This exposure may occur through ingestion or dermal contact with polynuclear aromatic hydrocarbons (PAHs) which are present in the contaminated surface soil. An additional physical hazard is currently posed to children by the debris piles and miscellaneous debris located on the Site.

The BLRA also identified unacceptable cancer and non-cancer risks posed by the Site under future land-use scenarios. As mentioned above, under the current land use conditions, exposure to PAHs in the surface soil poses an unacceptable level of cancer risk to trespassers. In addition, under the potential future use scenario of the Site being used as a park or recycling center, consumption of leachate from an on-Site well was estimated to pose a potential non-cancer (hazard index of 10 or HI = 10) and cancer (CR = 4×10^{-4}) risk to these park users. The primary chemicals that posed a non-cancer risk due to leachate consumption were cadmium, cobalt, copper, lead, nickel and zinc. The primary chemicals that posed a cancer risk were arsenic and

beryllium. Another potential health risk would also exist if a well was placed in or near the area contaminated with vinyl chloride. In this scenario, an unacceptable cancer risk (CR = 1 x 10^{-3}) exists if groundwater contaminated with vinyl chloride was consumed over a long exposure period by the resident(s) drinking from a contaminated well.

Environmental Risks

The ecological assessment conducted for the Site has determined that copper, mercury, and zinc concentrations in the surface soils at the Site may adversely affect small terrestrial mammal populations. Exposure of aquatic species to iron which was detected in exceedance of regulatory criteria also poses a potential risk. No conclusions could be reached as to whether past ecological effects have occurred due to the presence of other inorganic contaminants in surface water and sediments at the Site due to the lack of biota sampling or biological assays.

It is important to understand that the U.S. EPA has been directed by Congress to restore groundwater to its beneficial uses, whenever practicable.[1] The aquifers underlying the Site have been designated by the State of Illinois as Class I, i.e. a potential drinking water source. Federal MCLs, or more stringent state groundwater standards, are therefore ARARs for the groundwater at the Site. An exceedence of a federal MCL signifies that groundwater is unacceptably contaminated. Because of the threat to an important natural resource, an exceedence of an MCL, alone, can justify remedial action at a Site.[2]

Overall Protection of Human Health and Environment

The BLRA indicated that there is no current exposure to groundwater contamination present in the upper water-bearing unit downgradient of the landfill. However, the BLRA concluded that there is the potential for future excess risk to human health as a result of the presence of vinyl chloride. The considerable post-ROD database developed during the PDI and the IMP indicates

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[1] NCP, Part 300.430(a)(ii)(F) - *EPA expects to return usable ground waters to their beneficial uses wherever practicable, within a timeframe that is reasonable given the particular circumstances of the site. When restoration of ground water to beneficial uses is not practicable, EPA expects to prevent further migration of the plume, prevent exposure to the contaminated ground water, and evaluate further risk reduction.*

[2] *Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions*, OSWER Directive 9355.0-30, April 22, 1991.

that the area of vinyl chloride contamination in the upper water-bearing unit is limited. Moreover, the areal extent of the upper water-bearing unit downgradient of the Site is limited. The vinyl chloride plume is located entirely within a wetland area, which is likely to remain open space for the foreseeable future. The vinyl chloride plume is not migrating any further in a downgradient direction.

The ROD Amendment remedy will be protective of human health and the environment. The risks associated with a hypothetical future exposure of a resident using drinking water on the landfill or within the wetland area are not likely to occur since the PDI confirmed that contaminants lie completely within the landfill/wetland area where residential use is prohibited. Establishment of a groundwater management zone (GMZ) consistent with Illinois regulations (35 IAC Section 620) and existing restrictions on issuance of a well construction permit under the current Illinois Water Well Regulations (77 IAC Section 920) will effectively restrict the use of groundwater downgradient of the Site, thus, ensuring protection of human health while natural attenuation is occurring.

Summary

Actual and threatened releases of hazardous substances are occurring at and from this Site. The source of the risks originate from the contaminants within and emanating from the landfill through releases to groundwater, surface water, sediments, soils, and air. If not addressed, these releases may present an imminent and substantial endangerment to public health, welfare or the environment. Thus, it is necessary that corrective and mitigative action be taken to address the threats posed by the actual or threatened releases.

IX. DESCRIPTION OF ALTERNATIVES

Based on the results of the RI, PDI, quarterly monitoring, the Petition for an ESD, and the Petition for a ROD Amendment, a list of alternatives was assembled to address the Site remedial action objectives and ensure compliance with the requirements of the NCP. These alternatives were presented in detail in the Feasibility Study prepared for this Site. Alternatives 1 and 7 (below) have been selected from the original FS and are briefly described below. Alternative 12 was first presented in the Proposed Plan for this ROD Amendment. All alternatives have been updated to reflect 1998 dollars and costs.

ALTERNATIVE 1 (FROM JUNE 30, 1993, ROD) - NO ACTION

CERCLA requires that the No Action alternative be evaluated at every site to establish a baseline against which all other

alternatives are compared. Under this alternative, no remedial actions would take place and the Site would remain in its present condition.

Capital cost:	0
Maintenance and monitoring cost:	$10,000
Estimated present net worth:	$22,000
Estimated time to implement:	None

Note: The $10,000 maintenance and monitoring cost is not an annual cost, but reflects the cost of reviewing Site conditions on a five year basis.

ALTERNATIVE 7 - INSTITUTIONAL CONTROLS, CONSTRUCT GEOSYNTHETIC CLAY CAP, GROUNDWATER EXTRACTION SYSTEM, AND MONITORING (ORIGINAL REMEDY SELECTED IN THE JUNE 30, 1993, ROD)

The purpose of Alternative 7 is to minimize infiltration, promote surface water runoff, eliminate leachate seeps, isolate the contaminants of concern, and remediate the contaminated groundwater. These major elements of Alternative 7 include:

- Institutional controls
- Monitoring
- Geosynthetic clay cap
- Groundwater extraction, treatment, and discharge

Institutional controls would include land use restrictions and deed restrictions to preclude groundwater usage. The primary objectives of monitoring would be to monitor sedimentation basin and wetlands water quality, groundwater quality, and the condition of the landfill cap. Periodic groundwater sampling and analysis would be performed. Regular visual inspections would be conducted to evaluate the integrity of the landfill cap, and to check for erosion and differential settlement.

The landfill cap would be constructed as specified in 35 IAC 811.314. Generally, this includes removing the existing trees and brush, regrading the surface, sealing the leachate seeps, placement of a geosynthetic liner with a bentonite component, placement of a drainage layer, a rooting zone layer, and topsoil. The cap would then be revegetated. The geosynthetic clay layer would have a permeability comparable to 3 ft. of compacted clay (1×10^{-7} cm/s). The geosynthetic clay cap would extend to the edge of the landfill and would avoid the adjacent wetlands. The trees and brush removed from the landfill would be appropriately disposed of. Erosion control measures would be taken to protect the perimeter wetlands. A surface water control system would be designed appropriate to the final grade such that it would limit

erosion of the landfill cover from sheet flow, would not cause degradation of adjacent wetlands, meet local stormwater retention requirements, and allow for the monitoring of surface water runoff at distinct discharge points.

The groundwater extraction system would consist of installing groundwater extraction wells in the area of vinyl chloride contamination. Groundwater would then be pumped from the extraction system to the POTW. On-Site treatment would be required only if pretreatment standards were exceeded during this action.

Capital cost:	$7,054,000
Annual maintenance and monitoring cost:	$129,000
Estimated present net worth:	$8,655,000
Estimated time to implement:	6 months

ALTERNATIVE 12 - INSTITUTIONAL CONTROLS, CONSTRUCT MODIFIED (GEOSYNTHETIC) CAP, MONITORING, AND NATURAL ATTENUATION GROUNDWATER REMEDY, WITH CONDITIONAL ACTIVE PUMP-AND-TREAT SYSTEM

The purpose of Alternative 12 is to minimize infiltration, promote surface water runoff, eliminate leachate seeps, isolate the contaminants of concern, and remediate the contaminated groundwater. The following remedial actions from the June 30, 1993, ROD will not be modified by this ROD Amendment, and are included as part of this Alternative: fencing; contaminated soil/sediment excavation and consolidation; landfill gas collection system; well monitoring and remedy monitoring programs; institutional controls; correction of work deficiencies; and wetland mitigation. The major elements of Alternative 12 include:

- Institutional Controls
- Monitoring
- Modified Geosynthetic Cap
- Natural Attenuation Groundwater Remedy, with conditional requirement for installation of the active pump-and-treat system required by the June 30, 1993, ROD in the event that natural attenuation was not successful in remediating groundwater

Institutional controls would include land use restrictions and deed restrictions to preclude groundwater usage.

The primary objectives of monitoring would be to monitor sedimentation basin and wetlands water quality, groundwater quality, and the condition of the landfill cap. Groundwater sampling and analysis would likely be done on a periodic basis.

Periodic visual inspection of the landfill cap and monitoring for differential settlement would also be performed.

Landfill Cap: As modified, the landfill cap parameters would comprise:

- Recontouring and regrading of existing cover;
- recompacting the top 12 inches of the existing cover to achieve a 95 percent compaction by Standard Proctor Density (SPD) tests, in order to provide a firm soil foundation suitable for installing the landfill cover (if 95 percent compaction is not achievable, compaction will be to the highest achievable percentage, but not less than the compaction achievable by a minimum of three (3) passes over the regraded area with a vibratory compactor of at least 10-tons total weight);
- Installation of a 40-mil linear low density polyethylene liner;
- Installation of a drainage layer of either 12 inches of sand/gravel or a geonet;
- Installation of a geofabric between the drainage layer and the soil cover above;
- Installation of 24 inches of soil cover above the drainage layer, of which 6 inches must be topsoil (if 12 inches of sand or gravel is used for a drainage layer, the total cover above the low permeability layer would be 36 inches); and
- Final grading of the total cover to no less than 2.0 percent slope, after accounting for anticipated settlement.

The U.S. EPA estimates the cost of a landfill cap constructed in accordance with these parameters to be approximately $4.5 million.

Natural Attenuation with Contingent Pump-and-Treat System: Long-term monitoring of groundwater would be conducted to monitor and ensure the effectiveness of natural attenuation. Monitoring results will be evaluated annually to aid in predicting contaminant trends. A monitoring program would be developed during the remedial design phase and would include the development of a continuous monitoring record; identification of select locations to monitor changes in both the horizontal and vertical extent of contamination; sampling frequency; and

identification and monitoring of areas containing higher contaminant concentrations. The approximate cost of the long-term monitoring is estimated at $10,000 per year.

The U.S. EPA would evaluate the effectiveness of natural attenuation as part of the 5-year review process required for sites where wastes are left on site. If the data available at the first such review is insufficient for a reliable trend analysis, evaluation of remedy performance will be completed in the subsequent review or at some earlier time to be established during the initial 5-year review.

In the event that the trend analyses indicated that natural attenuation was not remediating the groundwater at a rate and to a degree acceptable to the U.S. EPA, in consultation with the IEPA, then the active pump-and-treat system required by the June 30, 1993 ROD would be a required part of this Alternative.

Capital cost:	$4,500,000
Annual maintenance and monitoring cost:	$129,000
Estimated present net worth:	$6,101,000
Estimated time to implement:	6 months

X. COMPARATIVE EVALUATION OF ALTERNATIVES

The NCP requires that the alternatives be evaluated against nine evaluation criteria. This section summarizes the relative performance of the alternatives by highlighting the key differences among the alternatives in relation to these criteria. The nine evaluation criteria are categorized as: (1) Threshold Criteria; (2) Primary Balancing Criteria; and (3) Modifying Criteria. Each of these terms is described as follows:

THRESHOLD CRITERIA

1) Overall protection of human health and the environment addresses whether a remedy provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced or controlled through treatment and engineering controls. The selected remedy must meet this criteria.

2) Compliance with ARARs addresses whether a remedy will meet federal and state environmental laws or justifies a waiver from such requirements. The selected remedy must meet this criteria or waiver of the ARAR must be obtained.

PRIMARY BALANCING CRITERIA

3) Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met.

4) Reduction of toxicity, mobility, and volume through treatment is the anticipated performance of the treatment technologies a remedy may employ.

5) Short-term effectiveness signifies: (1) short-term risks to a community during implementation of an alternative; (2) potential effects on workers engaged in implementation of the remedy; (3) potential environmental effects of the remedial action and effectiveness of mitigative measures; and (4) time until protection is achieved.

6) Implementability is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

7) Cost includes estimated capital and O&M costs, also expressed as net present-worth cost.

MODIFYING CRITERIA

8) Support Agency (IEPA) acceptance reflects aspects of the preferred alternative and other alternatives the IEPA favors or objects to, and any specific comments regarding federal and state ARARs or the proposed use of waivers.

9) Community acceptance summarizes the public's general response to the alternatives described in the proposed plan and in the RI/FS, based on public comments received.

Overall Protection of Human Health and the Environment: The U.S. EPA, in consultation with the IEPA, has concluded that Alterna' ve 1 would not satisfy the criterion of ensuring the overall protection of human health and the environment. The baseline risk assessment has documented unacceptable risks present at the Site and groundwater contaminant concentration levels exceed the federal MCLs. Alternative 1 does not meet the criterion because no remedial action would be taken and consequently, the present and future risks posed by the Site would not be adequately addressed, and further leachate generation and releases of contaminants to the environment would not be prevented.

Alternatives 7 and 12 would be protective of human health and the environment with regard to exposure to surface soils. The differences in cap design between these two alternatives is a function of their complexity: each would result in increased protectiveness from surface soil exposure. The surface water seeps which are a result of leachate generation are expected to be eliminated through placement of a cap on the landfill. The caps proposed may have the undesirable effect of trapping gas inside the landfill, resulting in a potential increase in lateral migration of landfill gas. This will be remedied through placement of a venting system in the landfill.

The Baseline Risk Assessment indicated that there is no current exposure to the groundwater contamination present in the upper water-bearing unit downgradient of the landfill. However, the Baseline Risk Assessment concluded that there is the potential for future excess risk to human health as a result of the presence of vinyl chloride. The considerable post-ROD database developed during the PDI and the IMP indicates that the area of vinyl chloride contamination in the upper water-bearing unit is limited. Moreover, the areal extent of the upper water-bearing unit downgradient of the Site is limited. The vinyl chloride plume is located entirely within a wetland area, which is likely to remain open space for the foreseeable future. The vinyl chloride plume is not migrating any further in a downgradient direction.

Both the June 30, 1993, ROD remedy and Alternative 12 would be protective of human health and the environment. The risks associated with a hypothetical future exposure of a resident using drinking water on the landfill or within the wetland area are not likely to occur since the PDI confirmed that contaminants lie completely within the landfill/wetland area where residential use is prohibited. Establishment of a GMZ consistent with Illinois regulations (35 IAC Section 620) and existing restrictions on issuance of a well construction permit under the current Illinois Water Well Regulations (77 IAC Section 920) will effectively restrict the use of groundwater downgradient of the Site, thus ensuring protection of human health while natural attenuation is occurring.

Compliance With ARARs: A listing of all ARARs associated with each alternative can be found in Table 11 of the FS. The ARARs for the new Alternative 12 are the same as the ones for Alternative 7. The U.S. EPA concurred with the IEPA's recommendation that, although the Site was closed pursuant to 35 IAC 807, certain requirements of 35 IAC 811 are relevant and appropriate to the landfill cap component of the remedy. More particularly, the U.S. EPA has determined that the following requirements of 35 IAC 811.314 are relevant and appropriate to

the landfill cap to be constructed as part of the final remedy for the Site: (1) alternative specifications for the low permeability layer provided that performance is equal to or superior to the performance of a layer meeting the requirements of subsections (b)(3)(A)(i) and (b)(3)(A)(ii) [35 IAC 811.314(b)(3)(A)(iii) & 35 IAC 811.314(b)(3)(C)]; and (2) preparation and compaction requirement [35 IAC 811.314(b)(3)(B)(iii)].

Only Alternatives 7 and 12 would comply with all chemical, action, and location specific ARARs associated with the Site. Other remedial alternatives exist which would not require mitigating the loss of these wetlands. (As a general matter, when the U.S. EPA selects a remedy that results in a loss of wetlands, mitigating the loss of those wetlands requires replacement on a 2 to 1 ratio.)

The U.S. EPA, in consultation with the IEPA, has determined that Alternative 12 would also comply with ARARs, including relevant and appropriate landfill cap requirements of 35 IAC 811, and would eliminate the Agency's concern about adverse impacts to the wetlands due to the construction and operation of a groundwater pump-and-treat system. Implementation of a natural attenuation remedy would require the establishment of a GMZ consistent with Illinois regulations (35 IAC Section 620).

Long-term Effectiveness and Permanence: Capping the landfill would contain the surface soils, sediments, sludges and wastes effectively. A cap would permanently reduce infiltration into the landfill, thereby reducing leachate generation to the maximum extent practicable. Both capping alternatives would eliminate human exposure to the contaminated surface soils and would also minimize the ecological risks posed by this media, with Alternative 11 being most protective due to the thickness of the cap. Alternatives 7 and 12 both provide for a drainage layer, which should contribute to long-term effectiveness of the remedy by ensuring that the cap is not damaged by standing water.

Alternative 7, which requires groundwater extraction, would be effective in preventing further migration of the vinyl chloride and would ultimately eliminate the threat posed by this media through extraction and treatment. Alternative 12, which requires natural attenuation of contaminated groundwater, would also be effective in preventing further migration of the vinyl chloride, would ultimately eliminate the threat posed by this media, and would eliminate the concern with potential adverse impacts to the wetlands due to the construction and operation of a groundwater pump-and-treat system.

Reduction of Toxicity, Mobility or Volume: None of the alternatives would reduce the toxicity or volume of the in-situ landfill wastes. Alternative 1 would only require monitoring and institutional controls. Alternatives 7 and 12 are containment alternatives. Both capping alternatives would reduce the volume of leachate being produced by minimizing infiltration. Each capping alternative would also reduce the mobility of the contaminants.

Using the maximum concentration noted in the plume during the PDI (14 μg/L) and an estimated volume of 4.4 million gallons of groundwater, there appears to be less than 0.5 pounds of vinyl chloride present in the plume. The vinyl chloride plume is not expanding any further in a downgradient direction, and the post-ROD data indicate the plume is smaller than defined during the RI. Alternative 7 (June 30, 1993, ROD remedy) would reduce the toxicity, mobility and volume of contaminants in the groundwater through an active groundwater extraction system. Alternative 12 would reduce the toxicity, mobility and volume of vinyl chloride contamination in the groundwater through natural attenuation. Each of these remedies would be equally effective in reducing the volume of vinyl chloride.

Short-term Effectiveness:

(1) Short-term community risks: Remediation activities under any but the no-action alternative would result in some risk of injury to community residents, due primarily to increased truck traffic on other related construction activities. Construction activities would also result in dust generation. The U.S. EPA believes, however, that traffic and dust control measures could be implemented so that any risk posed to the community could be minimized.

(2) Worker protection: During implementation of any but the no-action alterative, workers may be exposed to contaminated soils and other wastes. The U.S. EPA believes, however, that well-established protective measures would sufficiently ensure worker safety during implementation of any of the alternatives.

(3) Environmental effects and mitigative actions: Natural attenuation of the vinyl chloride plume under Alternative 12, would involve no impact to the wetlands. Alternative 7 (the originally-selected remedy) would involve extraction of the contaminated groundwater, which could result in dewatering of the wetlands. This dewatering is a potential short-term effect of each of these alternatives. (The U.S. EPA believes, however, that proper design of an extraction system could prevent or mitigate the threat.)

(4) Time to protection: It is expected that the duration of capping activities specified in Alternatives 7 and 12 would not exceed one year. Active remediation of the contaminated groundwater, as provided by Alternative 7 is not expected to exceed 22 years. Natural attenuation of groundwater, as provided by Alternative 12, would require approximately 25 years.

Implementability: All the alternatives are readily implementable. Capping and groundwater extraction have been proven to be an effective technology in remediating similar threats at other sites. Constructing a groundwater extraction system would involve the construction and operation of remedial components which use standard engineering and construction practices. It is considered relatively easy to implement, well developed, and reliable. If treatment is required before discharge, the technologies for treatment are proven and readily implementable.

The groundwater pump-and-treat remedy is more difficult to implement due to the construction of a groundwater collection and treatment system within the wetland area. It is important to note that the U.S. EPA would not select an alternative that required construction within a wetland without making a determination that no practical alternative existed. A U.S. EPA policy memorandum on floodplains and wetlands assessment for CERCLA actions states:

> *All possible alternatives must be considered, including the no action alternative. If one or more of the alternatives will be located in a wetland, those alternatives may not be selected unless a determination is made that no practicable alternatives exists outside the wetlands.*[3]

During the PDI field program, great difficulty was encountered in accessing the wetland areas for installation of monitoring wells and soil borings. It is expected that further difficulties would be encountered during the construction of a groundwater collection and treatment system in the wetland areas, due to the spongy nature of the soils. Further, encroachment into the wetlands during construction of the groundwater pump-and-treat system would have a deleterious effect on the wetlands environment. Operation of the system would likely have the same effect.

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[3] U.S. EPA, Office of Solid Waste and Emergency Response Policy on Floodplains and Wetland Assessments for CERCLA Actions, August 1985.

The natural attenuation remedy in Alternative 12 would require no construction and, as such, is quite implementable. In addition, implementing the natural attenuation remedy would eliminate the concern with adverse impacts to the wetlands due to the construction and operation of a groundwater pump-and-treat system.

Cost: The costs for the identified alternatives range from $22,000 (Alternative 1) up to $8,655,000 (Alternative 7) in terms of present net worth. The capital costs range from $0 (Alternative 1) up to $7,054,000 (Alternative 7). It would cost approximately $800,000 in capital cost and long-term O&M costs to implement the pump-and-treat component of the June 30, 1993, ROD. By contrast, the alternate remedy would require no capital expenditures and the costs for long-term monitoring are approximately $10,000 per year.

The following summary table lists each alternative and the associated costs:

ALTERNATIVE	COSTS		
	Capital	O&M	PNW
1. No Action	$0	$10,000	$22,000
7. Access Restrictions, Construct Geosynthetic Clay Cover, Groundwater Extraction System, and Monitoring	$7,054,000	$129,000	$8,655,000
12. Access Restrictions, Modified Landfill Cover, Natural Attenuation, Contingent Pump-and-Treat, and Monitoring	$4,500,000	$129,000	$6,101,000

Support Agency Acceptance: The IEPA has assisted in the development and review of materials in the Administrative Record. The IEPA has concurred with the originally selected remedy, as well as Alternative 12.

Community Acceptance: The residents of Woodstock, Illinois have been active participants in the remedy selection process at this Site. The affected community has expressed its desire for a protective remedy, but one that takes costs into account. The U.S. EPA has been sensitive to the fact that the municipality of Woodstock is a potentially responsible party for the Site. The concerns of the residents of Woodstock, as well as the Agency's responses thereto, are

set forth in the Responsiveness Summaries of this Amendment and the original ROD.

XI. DESCRIPTION OF SELECTED REMEDY

Based on its complete evaluation of the PDI data, the alternatives discussed above, and recent U.S. EPA guidance on landfill caps, the U.S. EPA, in consultation with the IEPA, has selected Alternative 12 as the Amendment to the original Site remedy. Alternative 12, together with those components of the original remedy that remain unchanged (fencing; contaminated soil/sediment excavation and consolidation; landfill gas collection system; well monitoring and remedy monitoring programs; institutional controls; correction of work deficiencies; and wetland mitigation), will be protective of human health and the environment, comply with ARARs, be cost-effective, and will utilize permanent solutions to the maximum extent practicable.

The major elements of this alternative include revising the landfill cap component and the groundwater pump-and-treat requirement of the remedy selected in the June 30, 1993 ROD.

Landfill Cap: As modified, the landfill cap parameters comprise:

- Recontouring and regrading of existing cover;
- recompacting the top 12 inches of the existing cover to achieve a 95 percent compaction by Standard Proctor Density (SPD) tests, in order to provide a firm soil foundation suitable for installing the landfill cover (if 95 percent compaction is not achievable, compaction will be to the highest achievable percentage, but not less than the compaction achievable by a minimum of three (3) passes over the regraded area with a vibratory compactor of at least 10-tons total weight);
- Installation of a 40-mil linear low density polyethylene liner;
- Installation of a drainage layer of either 12 inches of sand/gravel or a geonet;
- Installation of a geofabric between the drainage layer and the soil cover above;
- Installation of 24 inches of soil cover above the drainage layer, of which 6 inches must be topsoil (if 12 inches of sand or gravel is used for a drainage layer, the total cover above the low permeability layer would be 36 inches); and

- Final grading of the total cover to no less than 2.0 percent slope, after accounting for anticipated settlement.

The U.S. EPA estimates the cost of a landfill cap constructed in accordance with these parameters to be approximately $4.5 million, a significant savings over the estimated cost of the landfill cap required by the original ROD (~$6.2-million). Most importantly, after careful consideration, the U.S. EPA and the IEPA jointly believe that such a cap will be as protective of human health and the environment as the cap required by the original ROD.

Groundwater Pump-and-treat: The other component of the June 30, 1993, ROD remedy that the U.S. EPA is modifying is the requirement to construct a groundwater pump-and-treat system to address residual vinyl chloride contamination in the upper water-bearing unit, downgradient of the landfill. This ROD Amendment makes the pump-and-treat system a contingent component of the landfill remedy, required only if natural attenuation of the vinyl chloride plume does not occur at a rate and to the degree acceptable under state and federal law.

The U.S. EPA will evaluate the effectiveness of natural attenuation as part of the 5-year review process required for sites where wastes are left on site. If the data available at the first such review is insufficient for a reliable trend analysis, evaluation of remedy performance will be completed in the subsequent review or at some earlier time to be established during the initial 5-year review. If natural attenuation sufficiently remediates the contaminated groundwater, the remedy for the Site will cost approximately $800,000 less than calculated in the original ROD.

Groundwater cleanup standards must be achieved within a reasonable period of time for the contaminants of concern. The determination of whether additional measures will be required for groundwater will be based on compliance with the cleanup levels within a reasonable period of time. For this type of situation, a reasonable period of time for meeting the MCLs can be defined as less than 30 years.

Long-ter Monitoring: Long-term monitoring of groundwater will be conducted to monitor and ensure the effectiveness of the remedy. Monitoring results will be evaluated annually to aid in predicting contaminant trends. The monitoring program will be developed during the design phase and will include the development of a continuous monitoring record; identification of select locations to monitor changes in both the horizontal and vertical extent of contamination; sampling frequency; and identification and monitoring of areas containing higher contaminant concentrations.

5-Year Review: At each 5-year review or earlier, as necessary, the U.S. EPA, in consultation with the IEPA, will evaluate the following

criteria in order to determine the need for implementation of the contingent pump-and-treat remedy:

- Comparison of existing contaminant levels throughout the plume to MCLs;
- Trends in contaminant concentrations, if any;
- Effectiveness of the source control measures at cutting-off the source of contamination at the Site from the down gradient boundary;
- Potential reduction in restoration time-frames to less than 30 years;
- Potential for the contaminants in the ground water to reach appropriate levels throughout the plume.

Pump-and-treat may be necessary if an evaluation of the above criteria indicates: (1) concentrations have not decreased; (2) concentrations do not show the potential to decrease below MCLs in less than 30 years; or (3) source control measures do not meet their remedial objectives of preventing off-site contaminant migration.

XII. STATUTORY DETERMINATIONS

The selected remedy must satisfy the requirements of Section 121 of CERCLA to:

1. Protect human health and the environment;
2. Comply with ARARs;
3. Be cost-effective;
4. Utilize permanent solutions and alternate treatment technologies to the maximum extent practicable; and
5. Satisfy the preference for treatment as a principal element of the remedy.

The selected remedy for the Site, as modified by this ROD Amendment, satisfies the requirements of CERCLA as detailed below:

1. **Protection of Human Health and the Environment:** Implementation of the selected remedy will reduce and control potential risks to human health posed by exposure to contaminated ground water, soil, landfill waste, surface water, and sediments. The selected remedy will reduce potential exposure to contaminated groundwater and surface soils to within an acceptable risk range. The contaminated groundwater will be remediated until the MCL of 2 ppb is reached. The selected remedy also protects the environment from the potential risks posed by contaminants

discharging to ground water, the Kishwaukee River, surrounding soils, sediments, and wetlands.

Institutional controls:
Institutional controls have been implemented to protect against drinking of contaminated ground water at the Site, and to prohibit construction which could be detrimental to the remedy.

Capping the landfill:
In addition to reducing the potential risk posed by exposure to landfill contaminants, capping the landfill will reduce precipitation infiltration through the landfill, thereby reducing leachate generation. Ground water contaminant loading, leachate generation, and seepage into the wetlands will then be reduced or eliminated.

Construction of a drainage layer:
The U.S. EPA has determined that construction of a drainage layer above the barrier layer is necessary to ensure long-term protection of human health and the environment. Such a drainage layer will allow water to drain to the perimeter drains of the landfill cover, minimizing the saturated thickness of standing water (the head) in the soil over the barrier layer. In the absence of lateral drainage, water must either go up (evaporate) or down (infiltrate). The thickness and persistence of the head has a direct effect on infiltration through the barrier. Even synthetic barriers have imperfections from manufacturing and installation through which water can be transmitted. An efficient drainage layer with a hydraulic conductivity greater than 1 X 10^{-1} cm/sec, will virtually eliminate standing water in the protective layer, thus eliminating infiltration through the barrier layer.

Output results from the HELP model for various landfill cover profiles with and without drainage layers shows a decrease in infiltration of two-plus orders of magnitude when a good drainage layer is added. For example, modeling demonstrates that a final cover of 36 inches of compacted clay (hydraulic conductivity = 1 X 10^{-7} cm/sec), with a minimum 36-inch protective/vegetated layer, *even when frost damage is not considered*, will allow over two inches per year of infiltration. A cover with a geomembrane and a drainage layer with a hydraulic conductivity of 10 cm/sec, however, will allow less than 0.01 inches of infiltration annually. This demonstrates that inclusion of a drainage layer can have a significant effect on generation and migration of leachate in an unlined landfill.

An effective drainage layer design should maintain the saturated zone within the drainage layer under a peak storm event and

ensure less than ½-inch annual infiltration through the barrier layer (shown respectively as the peak daily head and average annual head outputs in the HELP model). A geonet is an excellent synthetic alternative, and may be more cost-effective than gravel, depending on local cost and availability of both materials.

Most landfill closure ARARs assume that a certain degree of engineering control already exists (e.g., bottom liners, leachate collection systems, etc.). No such engineering controls exist at the Site. In cases where the ROD requires installation of a leachate collection and/or ground water containment system, the importance of a drainage layer would be reduced, except in cases where it may be needed for slope-stability. However, since this Site is unlined, has no effective leachate collection system, the pump-and-treat portion of the June 30, 1993, ROD is being retained only as a contingent component of the remedy, and one of the remedial action objectives is to prevent furtner generation of leachate, the addition of the drainage layer to the remedy is necessary to compensate for the lack of these engineering controls, and to ensure long-term effectiveness of the overall remedy.

Gas venting:
A gas venting system will reduce potential risks due to the landfill gases.

Excavation and consolidation of contaminated sediments:
The U.S. EPA has required excavation and consolidation of wastes under the landfill cap to ensure that all wastes are located completely under the cap and to reduce settlement after capping.

Conclusion: No unacceptable short-term risks will be caused by implementation of the remedy. However, the nearby community, and Site workers, may be exposed to noise and dust nuisances during construction. Standard safety measures should manage any short-term risks. Dust control measures will mitigate risks as well. Mitigative measures, as specified during design, will be taken to prevent and address adverse environmental impacts.

2. **Compliance with ARARs:** With respect to any hazardous substances, pollutants or contaminants that will remain on-Site, CERLCA (§ 121(d)(2)(A)) requires the U.S. EPA to select a remedy which, at the completion of the remedial action, at least attains such legally applicable or relevant and appropriate standard, requirement, criteria, or limitation. The remedy selected in the original ROD, as modified by this ROD Amendment, will comply with all federal and state applicable or relevant and appropriate standards, requirements, criteria or limitations (ARARs). The

remedy will be implemented in compliance with applicable provisions of CERCLA and the NCP.

A. Chemical-Specific ARARs: Chemical-specific ARARs regulate the release to the environment of specific substances having certain chemical characteristics. Chemical-specific ARARs typically define the extent of cleanup at a site.

(1) Soils/Sediments: There are no chemical-specific standards established for soils and sediments.

(2) Ground Water: As noted above, the aquifers underlying the Site have been designated as Class I aquifers, i.e. a potential drinking water source, by the State of Illinois. The U.S. EPA is aware that a Woodstock municipal ordinance currently in effect prohibits the sinking of any groundwater wells at the Site. Nevertheless, as a Class I aquifer, state and/or federal drinking water standards are ARARs for this remedy:

a. Federal ARARs: The Safe Drinking Water Act's MCLs (40 C.F.R. § 141), Maximum Contaminant Level Goals (MCLGs) that are greater than zero, and Secondary Maximum Contaminant Levels (SMCLs) are ARARs for the Site.

b. State ARARs: The State of Illinois is authorized to administer the implementation of the federal Safe Drinking Water Act (SDWA). The State also has ground water quality standards promulgated under Title 35, Subtitle F, Chapter I, Part 620. To the extent that these state ground water quality standards listed under 620.410 are more stringent that the federal MCLs, MCLGs greater than zero, and the SMCLs, the state standards are ARARs for the ground water at the Site.

In the event that natural attenuation does not remediate the groundwater at a rate and to an extent acceptable to the U.S. EPA, in consultation with the IEPA, and a pump-and-treat system becomes a part of the remedy for the Site, then 35 IAC Part 218 will become an ARAR for the remedy.

(3) Surface Water:

a. Federal ARARs:

Section 304 of the Clean Water Act (CWA) establishes Ambient Water Quality Criteria (AWQC) for protection of human health and aquatic life. The AWCQ are considered relevant and appropriate at Superfund sites where a release or threat of a release is present or when remedial actions require point source discharges to surface water bodies. In the event that a pump-and-treat system is necessary at the Site, the federal AWCQ will be relevant and appropriate for the discharge.

b. **State ARARs:** The State of Illinois has been authorized to implement the National Pollutant Discharge Elimination System (NPDES) established under the CWA, as specified in IAC 35, Part 309. In the event that natural attenuation does not remediate the groundwater at a rate and to an extent acceptable to the U.S. EPA, in consultation with the IEPA, and a pump-and-treat system becomes a part of the remedy for the Site, then any discharge to waters of the State of Illinois, the chemical specific standards of Title 35, Subtitle C, Subpart B, Section 302.208 and toxic substances standards of Section 302.210 of the IAC establishing General Use Water Quality Standards will become ARARs for the Site.

B. **Location Specific ARARs:** Location-specific ARARs are those requirements that relate to the geographical position of a site. These include:

(1) **Protection of Wetlands:**

a. **Federal ARARs:** In the event that pump-and-treat is required, 40 CFR Part 6 is applicable to any remedial action taken within wetlands. This ARAR requires that activities required in a wetland must minimize the destruction, loss, or degradation of the wetland. In addition, any affected wetlands may be restored, as appropriate. The substantive requirements of any U.S. Army Corps of Engineers permit may need to be fulfilled, due to the potential that activities during construction may impact the wetlands.

(2) **Endangered Species Act:** Both the federal Endangered Species Act (16 U.S.C. § 1531) and the Illinois Endangered Species Protection Act, Title 17

Conservative Chapter 1, Subchapter C, Part 1075 Illinois Administrative Rules, require that actions must be performed to conserve the endangered or threatened species located in and around the Site. Remedial activities should not destroy or adversely modify the critical habitat upon which endangered species depend. Prior to conducting remedial activities, a survey of the Site will be conducted to determine whether or not endangered or threatened species may be affected by remedial activities. If such a threat exists, then the federal and/or state statute will be relevant and appropriate to the selected remedy, and therefore an ARAR.

C. **Action-Specific ARARs:** Action-specific ARARs are requirements that define acceptable treatment and disposal procedures for hazardous substances.

(1) **Federal ARARs:**

a. **Pretreatment Standards:** In the event that a pump-and-treat system is required, 40 C.F.R. 403 is applicable to its operation.

b. **Surface Water Runoff:** 40 CFR 122 is applicable to any surface water runoff from the Site, including stormwater runoff.

c. **Occupational Safety and Health Act (OSHA) Requirements:** 29 CFR 1910 and 1926 are OSHA requirements which are applicable to the Site. Threshold Limit Values as established by the American Council of Governmental Industrial Hygienists (ACGIH) are relevant and appropriate? during construction of the remedy.

(2) **State ARARs:**

a. **Closure of Solid Waste Landfills:** The selected remedy will comply with certain substantive requirements of Title 35, Illinois Solid and Special Waste Management Regulations, Section 811, Subpart C for closure of solid wastes landfills, specifically relating to final cover, air pollution, and closure requirements. The U.S. EPA, in consultation with the IEPA, has determined that these selected standards are relevant and appropriate to the landfill cap to be constructed at the Site.

Rationale for Selection of Landfill Cap ARARs: As reflected in the Responsiveness Summary to the original ROD and elsewhere in the Administrative Record, the U.S. EPA's selection of 35 IAC 811 as the relevant and appropriate standard for the landfill cap to be constructed at the Site has not been without controversy.

At the time of the original ROD, the U.S. EPA and the IEPA were aware that the landfill cap and closure requirements in effect at the time the Site was closed (1980) had been superseded by the more stringent requirements of 35 IAC 810-815, effective on September 18, 1990. The new Illinois landfill regulations were passed, in large part, to address landfill cap failures under the old 807 standards. In general, the new Illinois regulations were more extensive and more stringent than the federal RCRA Subtitle D landfill standards (which were effective October 9, 1991). The Illinois regulations were revised to incorporate the aspects of RCRA Subtitle D that were not already covered by Illinois law, and allowed Illinois to implement Subtitle D.

The new landfill standards had certain grandfather provisions. In particular, Part 814, Subpart E of the 1990 regulations allowed existing facilities to close under the old regulations (35 IAC 807) if closure was initiated by September 18, 1992.

Because the Woodstock landfill (i.e. the Site) initiated closure earlier than September 18, 1992, it was entitled under state law to close under the old 807 closure standards. Federal Superfund law provides, however, that when hazardous wastes will be left at a site, state and federal requirements that may not be directly applicable may still be relevant and appropriate to the circumstances of the release. If U.S. EPA makes the determination that a standard, or a portion of a standard, is relevant and appropriate, then that standard (or portion thereof) must be attained by the remedy just as if the standard were directly applicable.

At the time of the original ROD, both the U.S. EPA and the IEPA believed that the new 811 landfill cap standards, even if not directly applicable under state law to the Site, were relevant and appropriate to the circumstances of the release.

The IEPA and the U.S. EPA believed (and continue to believe today) that the public interest would be ill-served by designating 35 IAC 807 as the landfill cap standard. The Site was closed under the requirements of 807, and yet presented a sufficient hazard to human health and the environment to be placed on Superfund's list of national priorities. 35 IAC 807 did not require a bottom liner, control of gas releases, any significant long-term maintenance, capping materials impermeable enough to protect groundwater, or protection of the cap from freeze/thaw or wet/dry cycles (which would ultimately impact cap integrity). Despite construction in compliance with 807, groundwater at the Site became contaminated at levels exceeding federal and state action limits.

The U.S. EPA, in consultation with the IEPA, has determined that many of the requirements of 35 IAC 811 continue to be relevant and appropriate, and must be attained by the remedial action at the Site. The Site will never have a bottom liner or a leachate collection system, standard components of all landfills constructed today. The existing cover is predominantly clay, has been subjected to repeated wet/dry and freeze/thaw cycles since installation in 1980, and has failed. Simply repairing the existing cover under 35 IAC 807 would not solve the problem long-term, nor sufficiently reduce the surface water infiltration. The existing cover, once re-contoured and regraded, would continue to be subject to formation of macropores from repeated wet/dry and freeze/thaw cycles.

Rationale for Thickness of Final Cover: As noted above, in making a *relevant and appropriate* determination, the U.S. EPA has a fair degree of discretion in determining which specific requirements of a promulgated standard are, indeed, relevant and appropriate. The Agency has determined that the three-foot soil cover (over the barrier layer) requirement is not relevant and appropriate, and need not be attained by this remedy.

This remedy will require the installation of a geomembrane barrier layer. (The Agency has determined that a geomembrane will minimize the

encroachment of the landfill's *footprint* on adjacent wetlands.) Illinois regulations found at 35 IAC 811.314(b)(3) provide three options for a low permeability layer:

A) A compacted earth layer constructed in accordance with the following standards:

i) The minimum allowable thickness shall be 0.91 meter (3 feet);

ii) The layer shall be compacted to achieve a permeability of 1 x 10^{-7} centimeters per second and minimize void spaces.

iii) Alternative specifications may be utilized provided that the performance of the low permeability layer is equal to or superior to the performance of a layer meeting the requirements of subsections (b)(3)(A)(i) and (b)(3)(A)(ii).

B) A geomembrane constructed in accordance with the following standards:

i) The geomembrane shall provide performance equal or superior to the compacted earth layer described in subsection (b)(3)(A).

ii) The geomembrane shall have strength to withstand the normal stresses imposed by the waste stabilization process.

iii) The geomembrane shall be placed over a prepared base free from sharp objects and other materials which may cause damage.

C) Any other low permeability layer construction techniques or materials, provided that they

provide equivalent or superior performance to the requirements of this subsection.

In addition, the Illinois regulations at 35 IAC 811.314(c) also provide standards for the final protective layer as follows:

1) *The final protective layer shall cover the entire low permeability layer.*

2) *The thickness of the final protective layer shall be sufficient to protect the low permeability layer from freezing and minimize root penetration of the low permeability layer, but shall not be less than 0.91 meter (3 feet).*

3) *The final protective layer shall consist of soil material capable of supporting vegetation.*

4) *The final protective layer shall be placed as soon as possible after placement of the low permeability layer to prevent desiccation, cracking, freezing or other damage to the low permeability layer.*

Since geomembrane materials used for the low permeability layer are not subject to damage from freeze/thaw or wet/dry cycles, as clay barrier layers, the U.S. EPA has determined that a final protective cover of three feet of soil is not necessary to ensure protectiveness of the cap. The geomembrane barrier will require only sufficient cover to protect it from other forms of damage, such as heavy equipment, root penetration, or intrusive activities (human or animal). A 24-inch protective cover, as recommended by the U.S. EPA guidance, is fully adequate for this landfill. In addition, the combination of 18 inches of rooting zone and 6 inches of top soil is more than adequate to support vegetative cover.

Slope: The remedy includes, *Final grading of the total cover to no less than 2.0 percent slope,*

after accounting for anticipated settlement. The requirement for establishing a minimum slope after accounting for the anticipated settlement of the surface and subgrade of the landfill cover is intended to provide for rapid removal of water on the landfill cover and in the drainage layer of the cover. The U.S. EPA's guidance for constructing landfill covers recommends a minimum 3 percent slope after accounting for anticipated settlement. In the case of this Site, the U.S. EPA has already reduced the minimum slope requirement from three (3) to two (2) percent. The rationale for doing so in the case of this Site is: (1) the average waste thickness is approximately 7 feet, and is generally uniform; (2) the landfill stopped accepting waste in 1975, and much of the anticipated settlement has already occurred; and (3) localized differential settlement is expected to occur, but will be repaired as necessary during the operation & maintenance (O&M) phase, once the remedial action is completed.

b. **Groundwater:** In the event that the pump-and-treat system is installed (i.e. natural attenuation is not successful), any groundwater extracted shall comply with 35 IAC, Part 307 as well as 35 IAC, Part 310 which are ARARs for this Site since pretreatment standards, permitting, and reporting requirements must be met for POTW discharge.

c. **Groundwater Management Zone:** 35 IAC, Part 620.250 which provides for the establishment of a groundwater management zone is an ARAR for the Site.

3. **Cost-Effectiveness:** Cost effectiveness is determined by evaluating the following three of the five balancing criteria to determine overall effectiveness: (1) long-term effectiveness and permanence; (2) reduction of toxicity, mobility or volume through treatment; and (3) short-term effectiveness. Overall effectiveness is then compared to cost to ensure that the remedy is cost effective.

The selected remedy provides overall cost-effectiveness because it provides adequate long-term effectiveness and permanence. Secondary reduction in toxicity, mobility, and volume is accomplished through natural attenuation of the ground water and the mitigation of surface water infiltration through the landfill

cap. No unacceptable short-term risks will be caused by implementation of the remedy.

4. **Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable:** The selected remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. This finding was made after evaluation of the protective and ARAR-compliant alternatives for the Site remedial action and comparison of the trade-offs (advantage versus disadvantages) among the remedial alternatives with respect to the five balancing criteria (see discussion above).

5. **Preference for Treatment as a Principal Element:** The principal threats at the Site are the contaminated ground water and contaminated soil and leachate. The selected remedy uses treatment as a secondary element of the remedy through the natural attenuation of contaminated ground water. Due to the large volume and heterogeneous distribution of waste throughout the landfill, treatment of the landfill material itself is not practicable at this Site.

SUMMARY

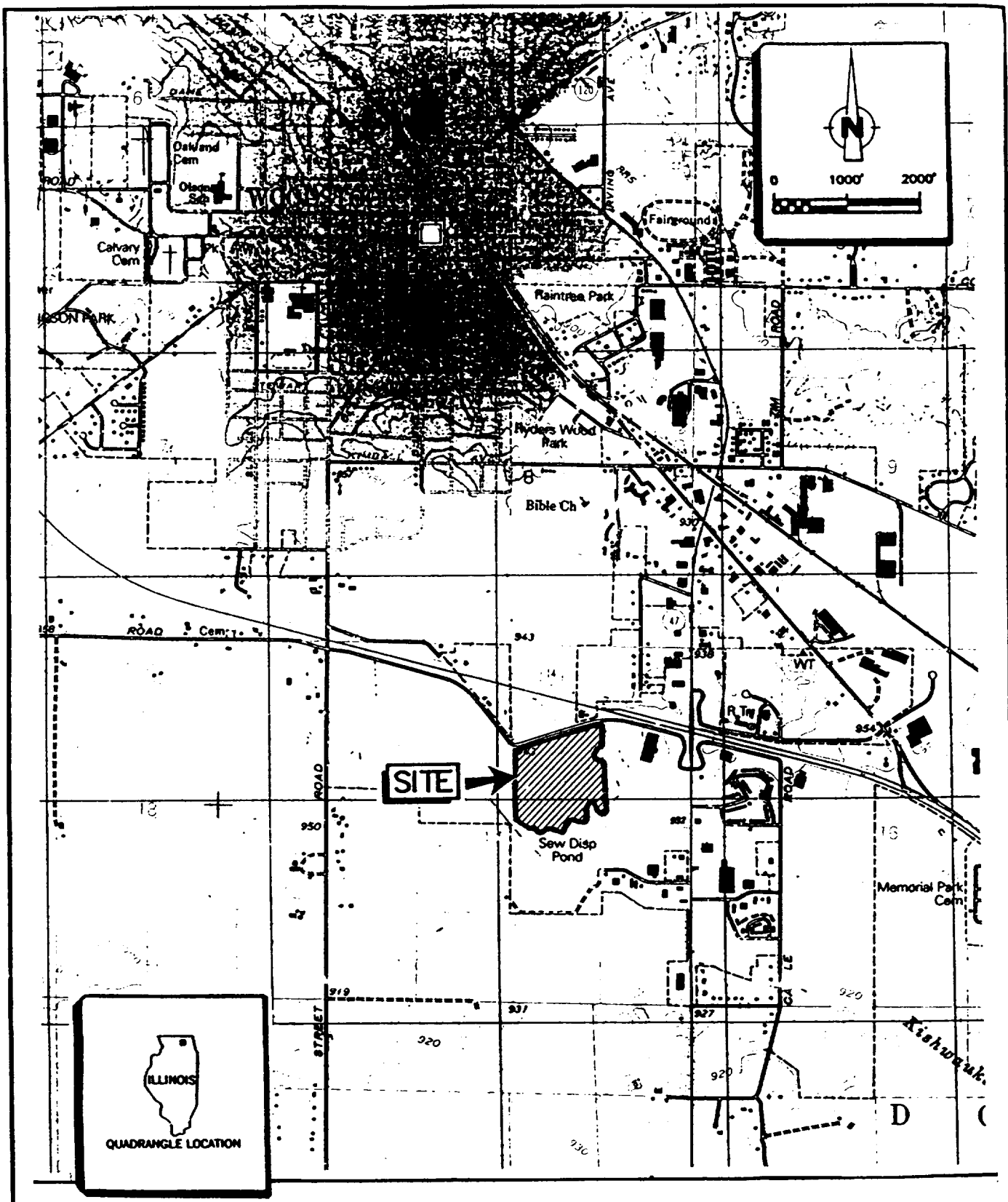
The remedy selected in the ROD of June 30, 1993, as modified by this ROD Amendment, is protective of human health and the environment, complies with federal and state ARARs and is cost-effective. The selected remedial action utilizes permanent solutions and considered the use of alternative treatment technologies to the maximum extent practicable. The original remedy, as modified by Alternative 12 of this ROD Amendment, protects human health and the environment, is cost-effective and addresses the CERCLA statutory preference for treatment. Since wastes will be left in place on-site, a review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment within five years after commencement of the remedial action, in accordance with CERCLA and the NCP (40 C.F.R. Part 300). As stated at various points earlier in this ROD Amendment, the U.S. EPA will determine, in connection with the five-year review process, whether the contingent pump-and-treat system of this remedy will need to be implemented.

FIGURES

WOODSTOCK MUNICIPAL LANDFILL SUPERFUND SITE

WOODSTOCK, MCHENRY COUNTY, ILLINOIS

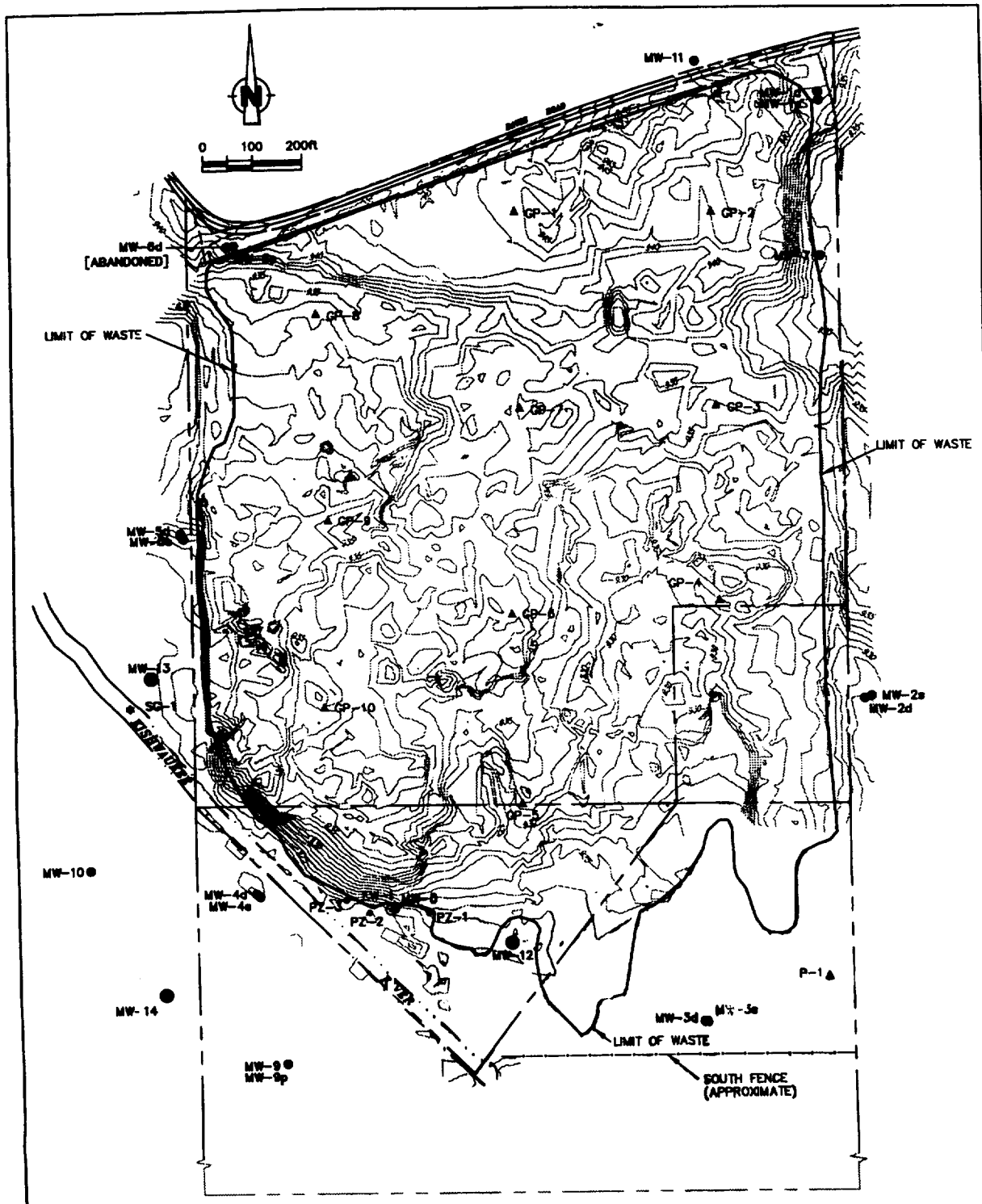
JULY 1998



SOURCE:
USGS TOPOGRAPHIC MAP
WOODSTOCK, ILL. QUADRANGLE

figure 1
SITE LOCATION
WOODSTOCK MUNICIPAL LANDFILL SITE
Woodstock, Illinois

iN)



LEGEND

———	PROPERTY BOUNDARY LINE
MW-3s ● MW-3d	MONITORING WELLS INSTALLED DURING RI s = SHALLOW WELL d = DEEP WELL p = PEAT WELL
PZ-1 ●	PIEZOMETER INSTALLED DURING PDI
P-1 ▲	PIEZOMETER INSTALLED DURING RI
SG-2 ✱	STAFF GAUGE INSTALLED DURING PDI
MW-14 ●	MONITORING WELL INSTALLED DURING PDI
EW-1 ◎	EXTRACTION WELL INSTALLED DURING PDI

figure 2.

SITE PLAN AND PROPERTY BOUNDARIES
WOODSTOCK MUNICIPAL LANDFILL SITE
Woodstock, Illinois